RECEIVED
CENTRAL FAX CENTER
AUG 2 5 2006

REMARKS

Claims 1-10 and 12-28 are presently pending. Claim 11 has been canceled. Claim 26 has been amended. Claims 2-5, 7, 10, 16-25, 27 and 28 have been withdrawn. The specification has been amended to correct typographical errors.

The Office Action indicates claims 1, 2 and 7 are allowed.

Applicant respectfully requests reconsideration of the application in view of the foregoing amendments and the remarks appearing below, which Applicant believes places the application in condition for allowance.

Objection to Specification

The Office Action contains objections to the specification for containing a number of typographical errors. More particularly, in the abstract, the word "features" appearing in each of lines 5 and 6 should read "feature." In paragraph 0009, line 4, the numeral "56" should be "44." In paragraph 0011, line 4, the word "of" following "systems" should be deleted. In paragraph 0029, line 5, a closing parenthesis should be placed immediately following the word "systems."

Applicant has made these changes and, therefore, respectfully requests withdrawal of the present objections.

Rejection under 35 U.S.C. § 102

Claims 6, 13 and 26 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,572,363 to Fergason. The Office Action states that Fergason discloses a system for projecting a real floating image into free space that contains all of the limitations of claims 6, 13 and 26. Applicant respectfully disagrees.

Fergason discloses a retroreflector based inline viewing system. In the embodiment of FIG. 1, light 40a is directed onto a beamsplitter 31 from an image source so as to reflect at least a portion (41a) of light 40a "backward" onto a retroreflector 32 located substantially at the focusing lens 30 of the image source. Retroreflector 32 reflects a portion of light 41a as light 42a that travels "forward" toward a viewer. Lens 30 is a focusing lens that focuses source

image 33 either onto retroreflector 32 or, alternatively, in front of or behind the retroreflector, as enlarged image 34. The same basic principles apply to the other Fergason embodiments.

Applicant asserts that despite the fact that Fergason refers to enlarged image 34 at retroreflector 32 as being a "real" image, it is unclear from the Fergason disclosure that this image is truly a real image. This is so because it is unclear as to what, precisely, Fergason intends "source image 33" to be. If enlarged image 34 is truly a real image and source image 33 represents the image that is focused by lens to create the enlarged image, then the enlarged image 34 should be reversed relative to the "source" image 33, i.e., the arrows of source and enlarged images should point in opposing direction. Since they are shown as pointing in the same direction, this suggests that enlarged image 34 is a virtual image. If, on the other hand, Fergason's characterization of enlarged image as being a real image is correct, then source image 33 is not a "source image" in the true sense of the term.

That said, assuming for the sake of argument that enlarged image 34 (and 34' in FIG. 3) is truly a real image as Fergason and the current Office Action assert, Applicant believes that the Fergason viewing system has a number of similarities relative to a conventional "forward" projection system in which a projector projects a real image onto a projection screen for viewing from the same side of the screen as the projector. Both systems project an enlarged real image onto a screen and provide a projected image much larger, typically one magnitude or more, but in the case of the Fergason system, the path of the projected light may be considered folded, rather than un-folded as in conventional forward projection systems.

Applicant agrees with the Examiner that a conventional forward projection system, which is essentially embodied in the Fergason system if enlarged images 34, 34' are real (and also the Tanaka et al. system discussed below), projects a real image. In addition, Applicant also agrees that if the screen (retroreflector in the case of the Fergason system) is removed, the real image may be considered to be floating in space. However, Applicant asserts that no matter where a fixed vantage point is located relative to the projection system and the floating real image, a human viewer of the floating image will not be able to view the entire floating image from that fixed vantage point. This is so because the floating real image is much larger than the

converging optic used to create the image, so that from any vantage point at most only a small portion of floating real image will be perceived by the viewer. Exhibit A illustrates this.

For the sake of description, Exhibit A shows two classes of rays, class I and class II. Class I rays are the rays from the projection optics that form an image of a single source point at at a corresponding focus point on the screen. An infinite number of such focused image points from the projection optic, i.e., one at every point on the screen area, are what make up the totality of the image on the screen. In a screen-containing system, each of those rays is diffused into many weaker rays covering a large cone of angles emanating from each focus point, so that every point of the screened image can send a small number of diffuse rays to a large range of vantage points. When the screen is removed, those rays are not diffused, and their paths continue on after focus in a now diverging cone with the same small angle at which they were originally converging.

Class II rays may be termed "envelope" rays that define the limited size of that portion of the real image that would be perceived by an observer at a given vantage point in the absence of a diffusing screen. These envelope rays represent the extreme border rays of the totality of class I rays that can actually reach the eye at a given vantage point, and thus define the limiting size of the image that can be seen from that vantage point, as Exhibit A illustrates. The remaining class I rays that actually focus in a cone at the screen location at these envelope intersections (although the screen is absent) are not shown. As they continue traveling in a straight line, they completely miss the observer's eye at the vantage point, and thus do not contribute to the image as seen from that vantage point, i.e., the observer cannot see them.

In order for a human viewer to visually perceive any portion of the floating real image, the image must be located between the projection optic and the viewer. Further, the viewer will only visually perceive any portion of the floating real image when that portion is being "illuminated" by the optic, i.e., when, from the vantage point at issue, that portion of the image is aligned with the optic. In this case, the optic provides the light rays to the eye necessary for the eye to form an image of the portion of the floating real image on the retina. When a portion of the floating real image is not aligned with the projection optic relative to a particular vantage

point, there is no source of light rays corresponding to that portion of the image for the eye to collect. In this case, the viewer does not visually perceive any of the image.

To illustrate, a human viewer at either of vantage points 1 and 2 will visually see only the small portion of the in-focus floating real image that is "illuminated" by the small projection optic. A human viewer positioned at vantage point 3, will not visually perceive any of the in-focus floating real image because from this vantage point no portion of the image is illuminated by the projection optic. A study of Exhibit A shows that, indeed, there is no fixed vantage point where the entire enlarged floating real image is illuminated by the optic. It is noted that while Exhibit A does not explicitly depict the Fergason system, the Fergason system is a variation that includes a reflecting beamsplitter that folds to light path so that the projected real image is focused in a plane located near the projection optic.

In this connection, it is noted that the current Office Action appears to suggest on page 5, in item 11, that the Fergason system provides a real image floating in free space at viewing location 11. In particular, the Office Action states "Fergason discloses a system (See for example Figures 1, 3) for projecting a real floating image into free space (See for example 34', 11 in FIG. 3; col. 7, lines 20-40) . . . ." [Emphasis added.] If the intent of the excerpt is to assert that a floating real image is present at viewing location 11, Applicant respectfully disagrees. It is Applicant's position that numeral "11" denotes only a viewing location and not a location of a real image. The real image is formed at 34' in FIG. 3. The retroreflector helps to provide more light to viewing location 11 so that enlarged real image 34' appears bright. However, there is no floating real image formed at viewing location 11. The only image formed at viewing location 11 is the real retinal image (non-floating) produced by the lens of an eye when the eye is present in the viewing location. Without the eye's lens, there is no image whatsoever in viewing location 11.

Regarding rejected claims 6, 13 and 26, the floating image projection system of the present invention and amended independent claim 26 require that the "converging element [be] operatively configured so that when said at least one image source provide said source image, said optical system for a real floating image of said source image in free space such that a human viewer visually perceives the entirety of said real floating image when the viewer is properly

positioned at a vantage point relative to the system." As discussed above and illustrated by Exhibit A, the Fergason converging optic is not configured in a way that the enlarged real image can be perceived from a fixed vantage point.

For a floating image to be visually perceived in its entirety, the converging optic that forms the image must illuminate the entire image from a proper vantage point. The attached Exhibit B illustrates that when the projecting optic is larger than the floating real image, a viewer can visually perceive the entire floating image from one or more vantage points, e.g., vantage points 1 and 2, and can visually perceive a large portion of the floating image from many other vantage points, e.g., vantage point 3. This is so because the relatively large projection optic provide a relatively large region of illumination "behind" the floating real image for providing the light rays necessary for the eye to collect and form a retinal image of the floating real image.

Importantly, in the Fergason system the converging optic, i.e., focusing lens 30, is not configured to make the entire enlarged image 34 viewable as a floating image, i.e., without retroreflector 32. Again, this is so for the simple reason that the floating real image (enlarged image 34 with retroreflector 32 removed) is much larger than lens 30. It is noted that the particular arrangement of components of the Fergason system leads to other reasons that a viewer would not be able to view the entire enlarged image 34 as a floating image. However, Applicant believes it is not necessary to discuss these, since the fact remains that the Fergason system does not satisfy at least the above-quoted limitation of amended claim 26 for at least the reasons just discussed. Consequently, Applicant asserts that the Fergason patent does not anticipate amended claim 26, nor claims 6 and 13 that depend therefrom.

Regarding the addition to claim 26 of the language "such that a human viewer visually perceives the entirety of said real floating image when the viewer is properly positioned at a vantage point relative to the system," it is Applicant's position that this concept is inherent and explicit both in the current application and in U.S. Patent No. 6,262,841 issued to the current inventor that is incorporated by reference into the current application. (The '841 patent is also directed to a system for projecting a real image into space.) For example, all of the figures of the current application except FIG. 4 and all of the figures of the '841 patent show a human eye at a fixed point viewing the entirety of the corresponding respective floating images. Clearly, the

presence of the human eye in all of these figures is to illustrate that a human can view (visually perceive) the entirety of the floating image from the point at which the eye is depicted. This is, perhaps, most clearly demonstrated by FIG. 12 of the '841 patent that illustrates two viewers that are represented by two corresponding respective eyes located at differing locations. In addition, it is noted that in all of the figures of the current application (except FIG. 4) and the '841 patent the floating image is shown as being smaller than the corresponding respective projecting optic. Consequently, Applicant asserts that amended claim 26 is fully supported by the original disclosure and that those skilled in the art would readily recognize this is so.

For at least the foregoing reasons, Applicant respectfully requests withdrawal of the present anticipation rejection.

Rejections under 35 U.S.C. § 103

Claims 6, 8, 9, 12-15, and 26 stand rejected under 35 U.S.C. § 103 as being obvious in view of the Tanaka et al. and Hoppe patents or, alternatively, the Tanaka et al. and Hoppe patents further in view of the Broer et al. reference, stating that Tanaka et al. disclose all of the limitations of these claims except for a broadband reflector-polarizer. The Examiner then states that Hoppe or, alternatively, Hoppe and Broer et al. disclose the missing limitation and asserts that it would have been obvious to a person having ordinary skill in the art at the time of the invention to provide the Tanaka et al. optical system with a broadband reflector-polarizer as disclosed by Hoppe or Hoppe and Broer et al. Applicant respectfully disagrees.

The disclosures of Tanaka et al, Hoppe, and Broer et al. are as discussed in the Response filed June 17, 2005.

As briefly mentioned above, the Tanaka et al. projection system is a conventional system for projecting an enlarged real image onto a screen (5). Consequently, the projected real image is larger than the projection optics. For the same reasons discussed above relative to the Fergason system, the Tanaka et al. optics are not configured to allow a human viewer to visually perceive (view) the entire projected image from a single vantage point as required by amended claim 26 and claims 6, 8, 9 and 12-15 that depend therefrom. Neither the Hoppe nor Broer et al. documents disclose or suggest this limitation. Since none of the applied references disclose or

suggest this limitation, either alone or in combination with one another, the combination of these references cannot render claims 6, 8, 9, 12-15 and 26 obvious as these claims have been.

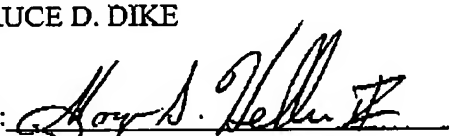
For at least the foregoing reasons, Applicant respectfully requests withdrawal of the present rejection.

Conclusion

In view of the foregoing, Applicant respectfully submits that claims 1-10 and 12-28, as amended, are in condition for allowance. Therefore, prompt issuance of a Notice of Allowance is respectfully solicited. If any issues remain, the Examiner is encouraged to call the undersigned attorney at the number listed below.

Respectfully submitted,

BRUCE D. DIKE

By: 

Morgan S. Heller II
Registration No.: 44,756
Downs Rachlin Martin PLLC
Tel: (802) 863-2375

Attorneys for Applicant

Attachments:
Exhibits A and B

BTV.526141.1

EXHIBIT A

CONVENTIONAL PROJECTOR SYSTEM

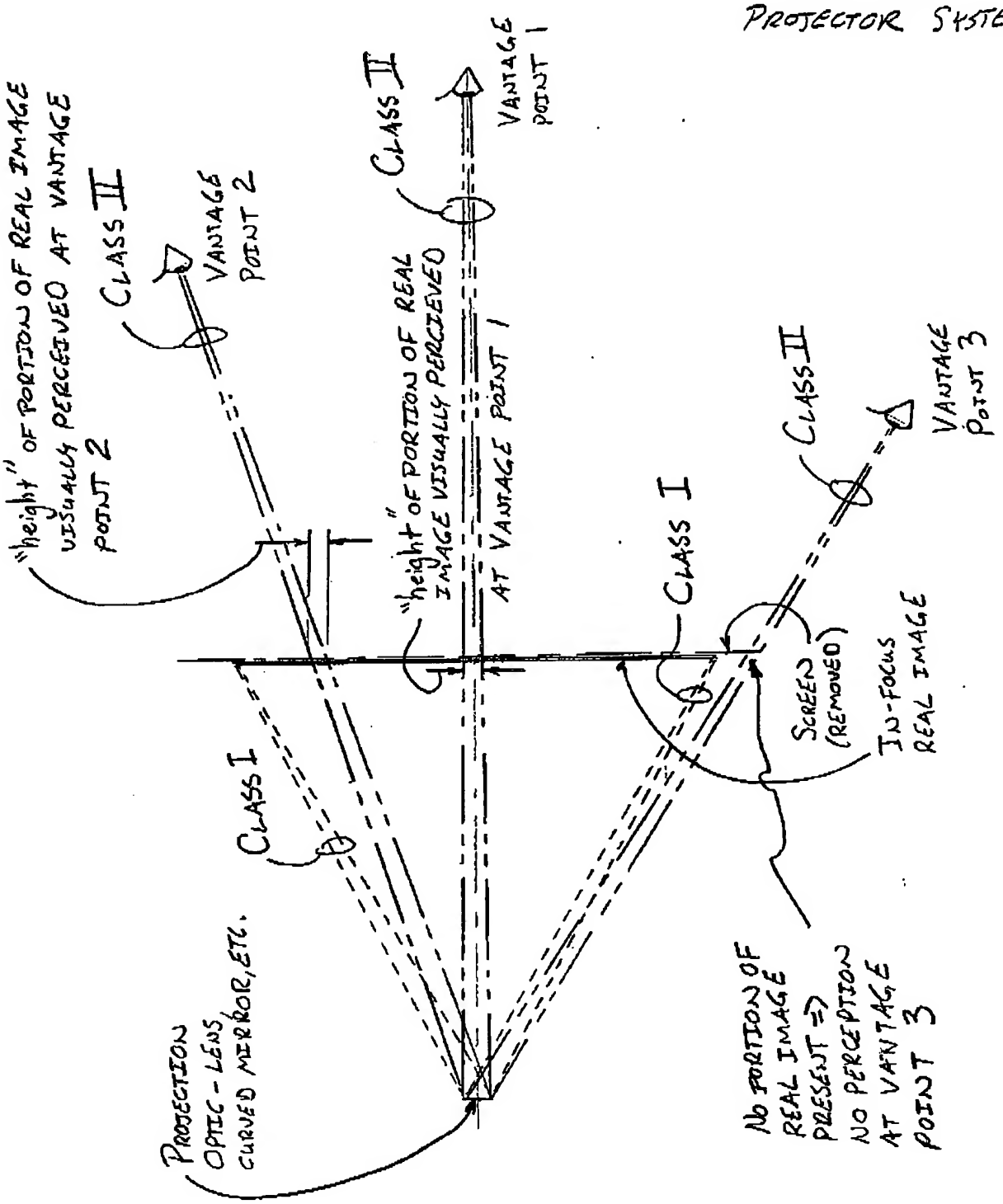


EXHIBIT B

FLOATING IMAGE PROJECTOR SYSTEM